Amendment to claims:

This listing of claims will replace all prior versions and listing of claims in the application:

Listing of claims:

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Currently Amended) ~~The FIB system of claim 1 further comprising~~ In a FIB system including a system vacuum chamber; an ion gun including a liquid metal ion source; a plurality of lens elements for extracting and focusing ions, one or more beam apertures; and an electrostatic deflection means, the improvement comprising one or more dielectric bushings for positioning one or more lens elements and for providing a sealable vacuum container for the one or more elements, the interior of the vacuum container being vacuum selectively isolatable from the environment in the system vacuum chamber, and apertures including electroetched, electroformed, or laser ablated beam apertures.

7. (Currently Amended) ~~The FIB system of claim 1 further comprising~~ In a FIB system including a system vacuum chamber; an ion gun including a liquid metal ion source; a plurality

of lens elements for extracting and focusing ions, one or more beam apertures; and an electrostatic deflection means, the improvement comprising one or more dielectric bushings for positioning one or more lens elements and for providing a sealable vacuum container for the one or more elements, the interior of the vacuum container being vacuum selectively isolatable from the environment in the system vacuum chamber. an in-vacuum isolation valve mechanism, the in-vacuum isolation valve having no mechanical linkage from the valve to the outside of the system vacuum chamber.

8. (Previously Presented) The FIB system of claim 7 in which the in-vacuum isolation valve includes a pneumatic bellows to activate the valve.

9. (Previously Presented) The FIB system of claim 7 in which the in-vacuum isolation valve includes a pushrod and bell crank to activate the valve.

10. (Cancelled)

11. (Currently amended) The FIB system of claim ~~10~~ 32 in which the in-vacuum aperture changing mechanism comprises one or more piezoelectric actuators, DC motors or stepper motors for driving stage.

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Currently Amended) An ion gun for a focused ion beam system, comprising: a gun chamber housing being at least partially constructed of a dielectric material and defining a gun chamber; an emitter assembly positioned within the gun chamber housing, the emitter assembly including a pre-aligned liquid metal ion emitter, a suppressor, an extractor and an extractor aperture; and one or more ion optical elements fastened to the gun chamber housing and aligned with the emitter assembly. ~~The ion gun of claim 12 in which~~ the position of the emitter assembly is fixed in alignment relative to the one or more ion optical elements fastened to the dielectric housing.

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Currently Amended) ~~The method of claim 26 further comprising~~ In a particle beam system including a focused ion beam column within a system vacuum chamber, the focused ion beam column including a liquid metal ion source, a plurality of lens elements for extracting and

focusing the ions, one or more beam apertures, an electrostatic deflection means, beam blanking means, and vacuum pump plus associated electronics and controls, the improvement comprising a vacuum isolation valve for isolating the gun vacuum container, the vacuum isolation valve actuation mechanism being operable without a mechanical drive connection to outside a system vacuum chamber.

28. (Currently Amended) The ~~method~~ system of claim 27 in which the vacuum isolation valve is operated pneumatically and in which a pneumatic connection for operating the vacuum isolation valve passes through the wall of the system vacuum chamber.

29. (Currently Amended) ~~The method of claim 26 further comprising~~ In a particle beam system including a focused ion beam column within a system vacuum chamber, the focused ion beam column including a liquid metal ion source, a plurality of lens elements for extracting and focusing the ions, one or more beam apertures, an electrostatic deflection means, beam blanking means, and vacuum pump plus associated electronics and controls, the improvement comprising, an automated variable aperture drive positioned within the vacuum chamber, the drive being operable without a mechanical drive connection to outside the vacuum chamber.

30. (Original) The method of claim 29 in which the automated variable aperture drive includes a piezoelectric positioner.

31. (Original) The method of claim 29 in which the automated variable aperture drive includes an electric motor.

32. (Previously Presented) ~~The FIB mechanism of claim 10~~ In a FIB system including a system vacuum chamber; an ion gun including a liquid metal ion source; a plurality of lens elements for extracting and focusing ions, one or more beam apertures; and an electrostatic deflection means, the improvement comprising ~~in which the~~ an in-vacuum aperture changing mechanism ~~comprises~~ including a drive mechanism that is contained within the system vacuum chamber, thereby eliminating the requirement for a mechanical feedthrough to change the aperture.

33. (Cancelled)

34. (Currently Amended) ~~The FIB mechanism of claim 12~~ An ion gun for a focused ion beam system, comprising: a gun chamber housing being at least partially constructed of a dielectric material and defining a gun chamber; an emitter assembly positioned within the gun chamber housing, the emitter assembly including a pre-aligned liquid metal ion emitter, a suppressor, an extractor and an extractor aperture; and one or more ion optical elements fastened to the gun chamber housing and aligned with the emitter assembly, ~~in which~~ the emitter assembly ~~is~~ being attached to the gun chamber housing and fixed in relation to the one or more ion optical elements.

35. (Currently Amended) In a FIB column including a system vacuum chamber; an ion gun including a liquid metal ion source; a plurality of lens elements for extracting and focusing the ions, one or more beam apertures; and an electrostatic deflection means, the improvement comprising an in-vacuum isolation valve for isolating the ion gun from the system vacuum

chamber, the in-vacuum isolation valve having no mechanical linkage from the valve to the outside of the system vacuum chamber.

36. (Previously Presented) The FIB of claim 35 in which the in-vacuum isolation valve includes a pneumatic bellows to controllably activate the valve.

37. (Previously Presented) The FIB of claim 35 in which the in-vacuum isolation valve includes a pushrod and bell crank to activate the valve.